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Part IV: Data Science and Analytics

Preface

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The amount of data is growing at an exponential rate and we are faced with a challenge to analyze process and extract useful information from this vast amount of data. Data science is the key to opening architecture in order to combine the different capabilities and functions of data analysis. The first function is to understand that real-world problems are the aim of the data analysis. The second is to interpret this real problem through mathematical computing. Third is to translate the performance obtained by the use of mathematical computing to a value in the real world. These functions define the spectrum of analytics which is the essence of the concept of the data science. Although the concept of data science was first proposed in the framework of exploratory data analysis, today it is definitely providing a new wave of advanced data analysis.

Part IV of this book presents various novel approaches from a wide range of data science and analytics. First, various data mining techniques are discussed including probability theory with mixture distribution, text mining including semantic meaning of language by using random index vectors, time-series data mining to detect financial structure change and accounts manipulation, and MapReduce-based algorithms for big data. Second, various network analyses are discussed for various cross over the technical areas in the field of data mining, such as wireless sensor networks including intelligent computation and adaptation capability, optical networks in the framework of MILP, neural networks for knowledge extraction from survey data, a notion of resilience that works for scale-free networks, self-organizing and self-healing modern wireless networks, and sampling from geographic networks are all discussed in this session. Third, system oriented methods are also discussed in the form of a keyword system for academic research articles, the use of big data and knowledge discovery for a decision support system, and the improvement of a user-friendly system for a system with a knowledge-based component. Forth, target data in fields as varied as education, such as self-organizing evolving education, collaborative learning, STEM education including multidisciplinary program, and the integration of the arts into STEM education. In addition, in the economic area, we find minimum spanning trees applied for currency exchange markets, a cascade stock trading model, and forecasts of money demand, all in the functional data part of this session. Also, the area of data security and data privacy process techniques, homomorphic encryption, and chaotic encryption convolutional encoding are discussed. As conference co-chair for Part IV, I wish to thank the authors of these papers for their time and effort invested to add to our understanding of the important topic of data science and analytics.

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